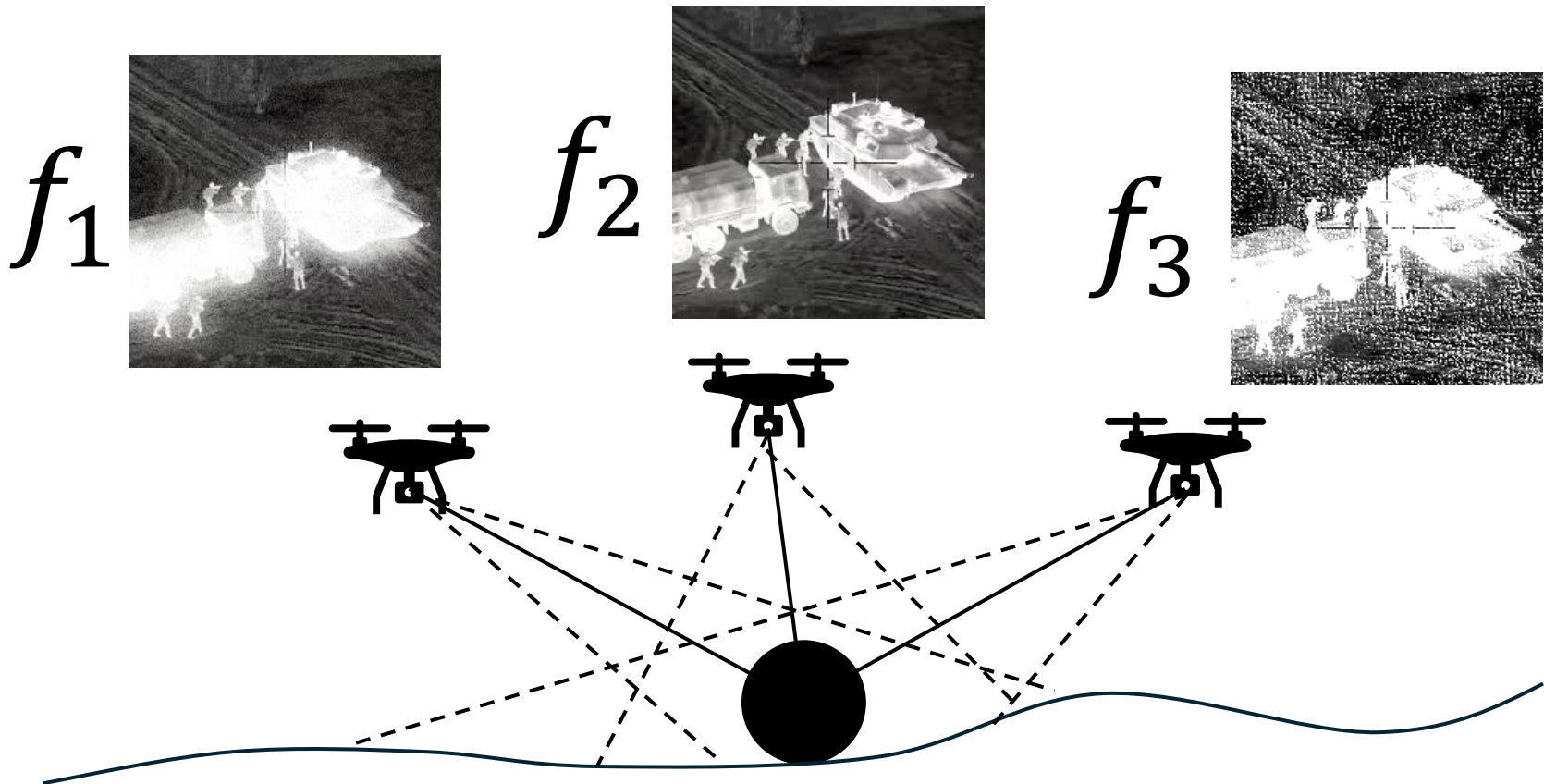


Simulation-based modelling of UAV thermal sensing for information- driven autonomous perception

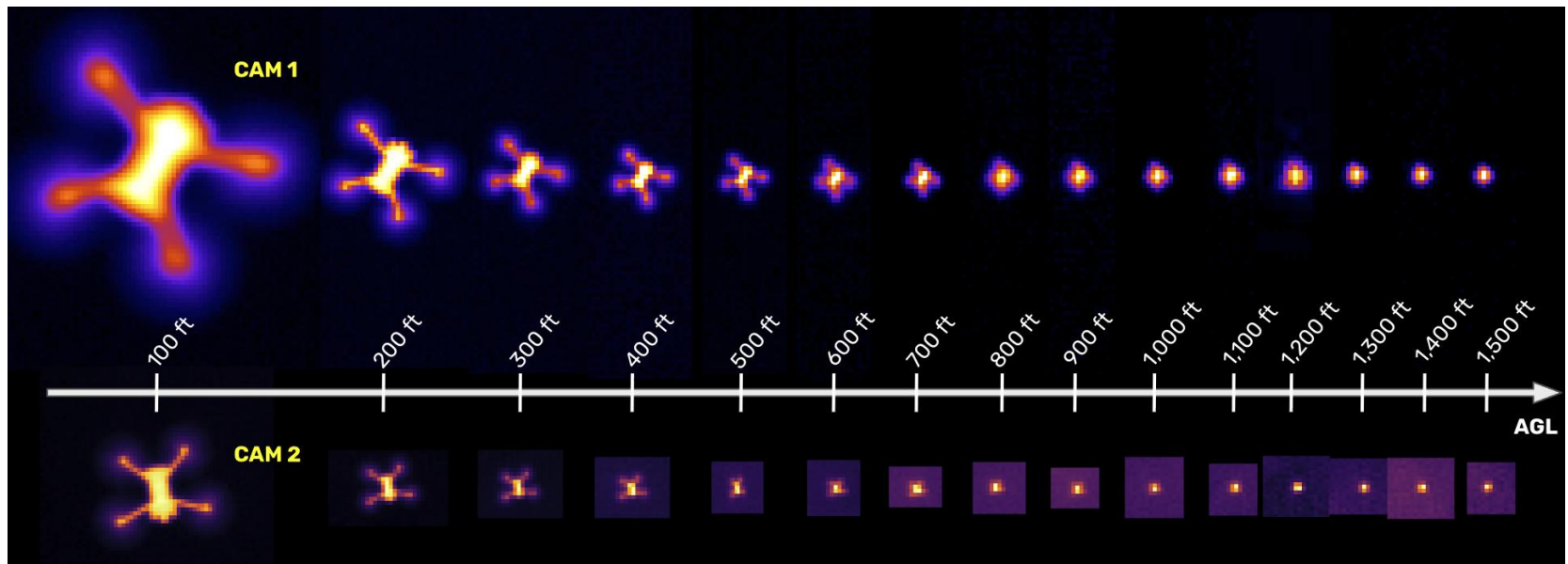
Wojciech Łożyński, MSc Eng - (wojciech.lozynski@student.wat.edu.pl)

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Origin of the subject



Related work



source: <https://www.axiomoptics.com/blog/understanding-fov-and-resolution-in-a-high-resolution-thermal-camera/>

Related work

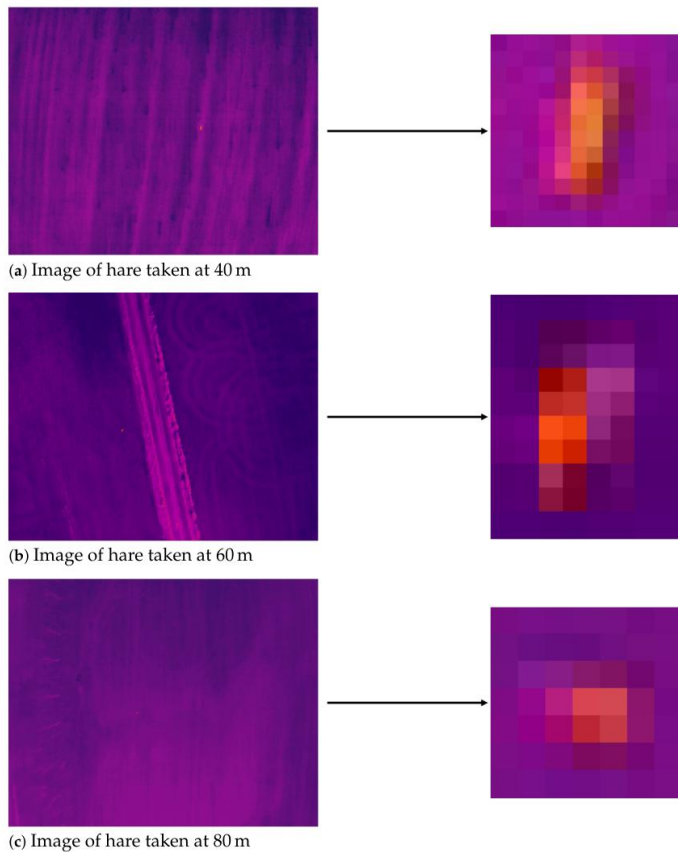
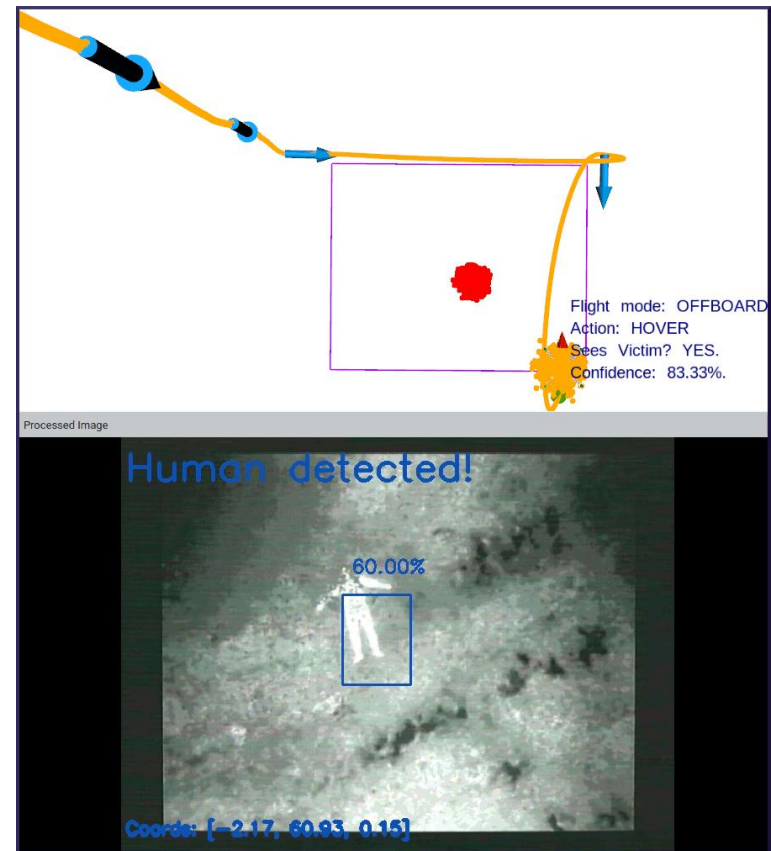


Figure 3. Thermal images of hare taken at an altitude of 40, 60, and 80 m, respectively.



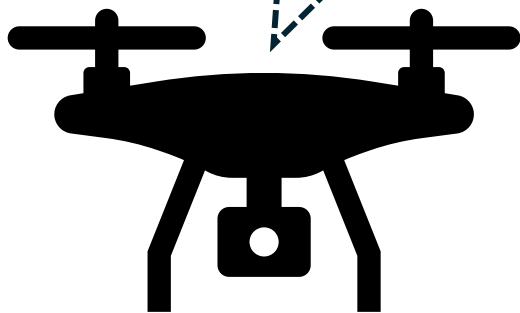
Information image content modelling

$$I_h = f(x_1, \dots x_i, y_1, \dots y_i \dots)$$

I_h - Information content of the object captured in the image, based on information entropy;

x_i - UAV flight conditions;

y_i - Other parameters relevant to information content



Method of evaluating image information content

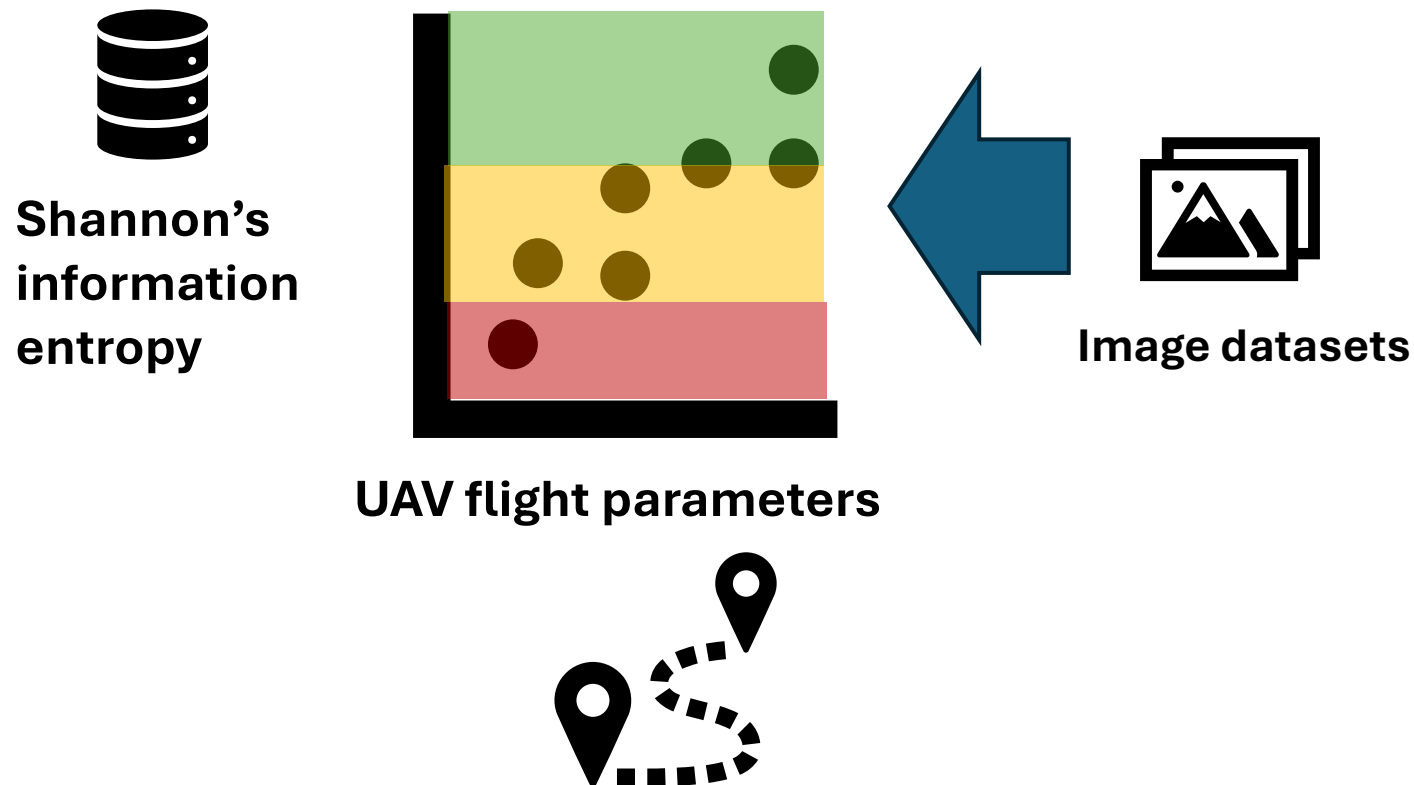


Image processing framework

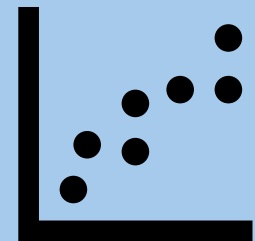
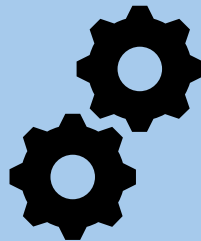
Python monolithic application

Trajectory
calculation

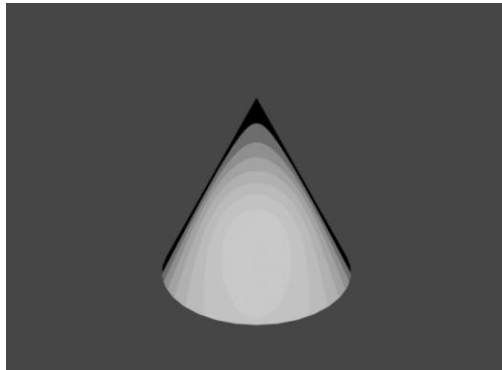
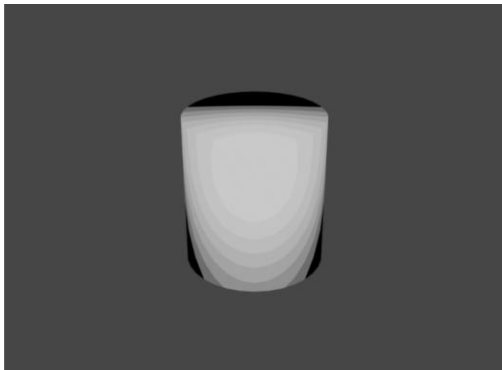
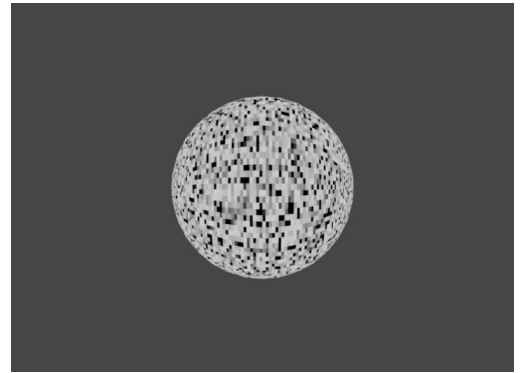
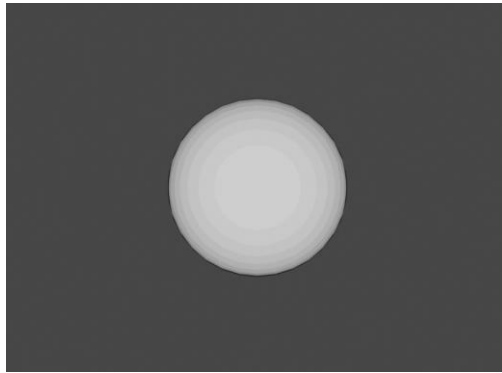
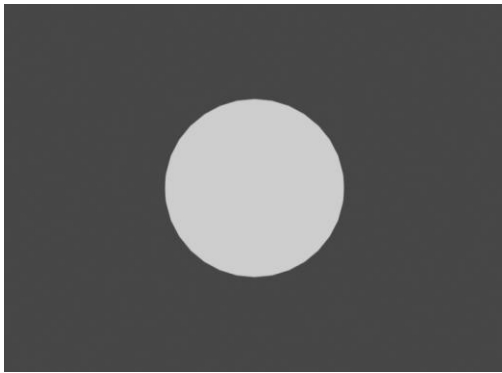
Image
processing

Data
persistence

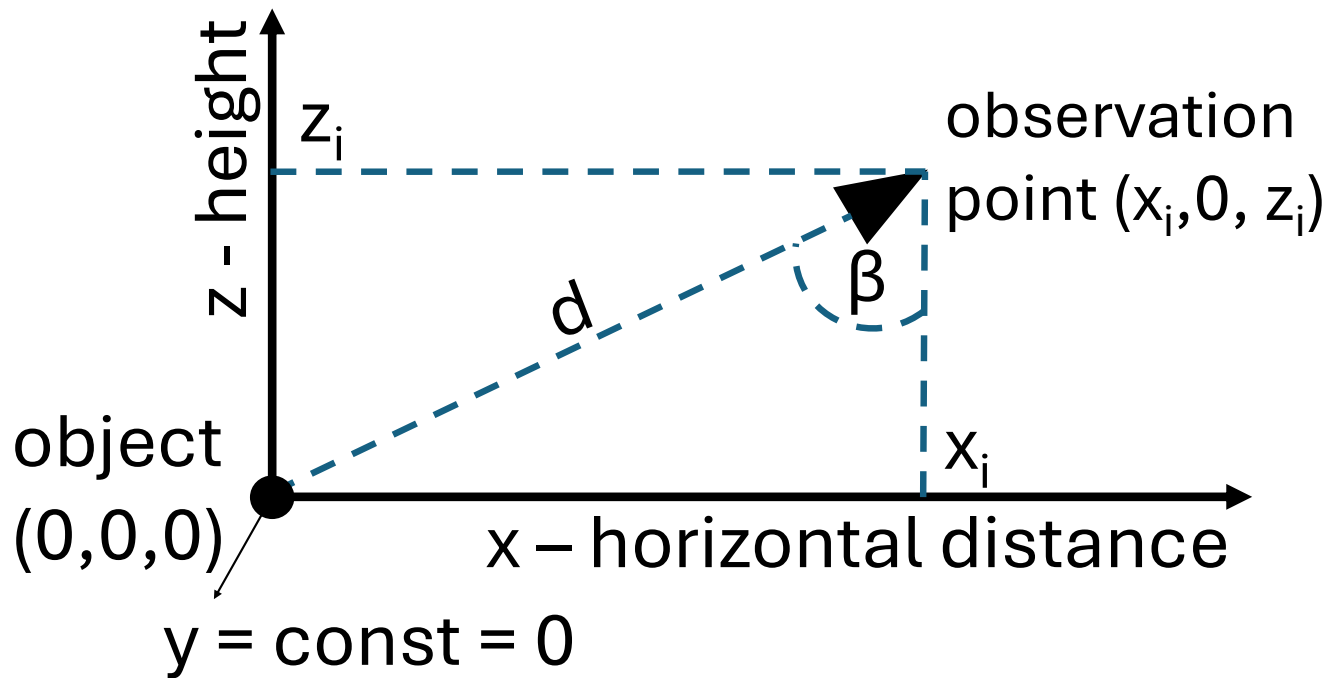
Data
visualization



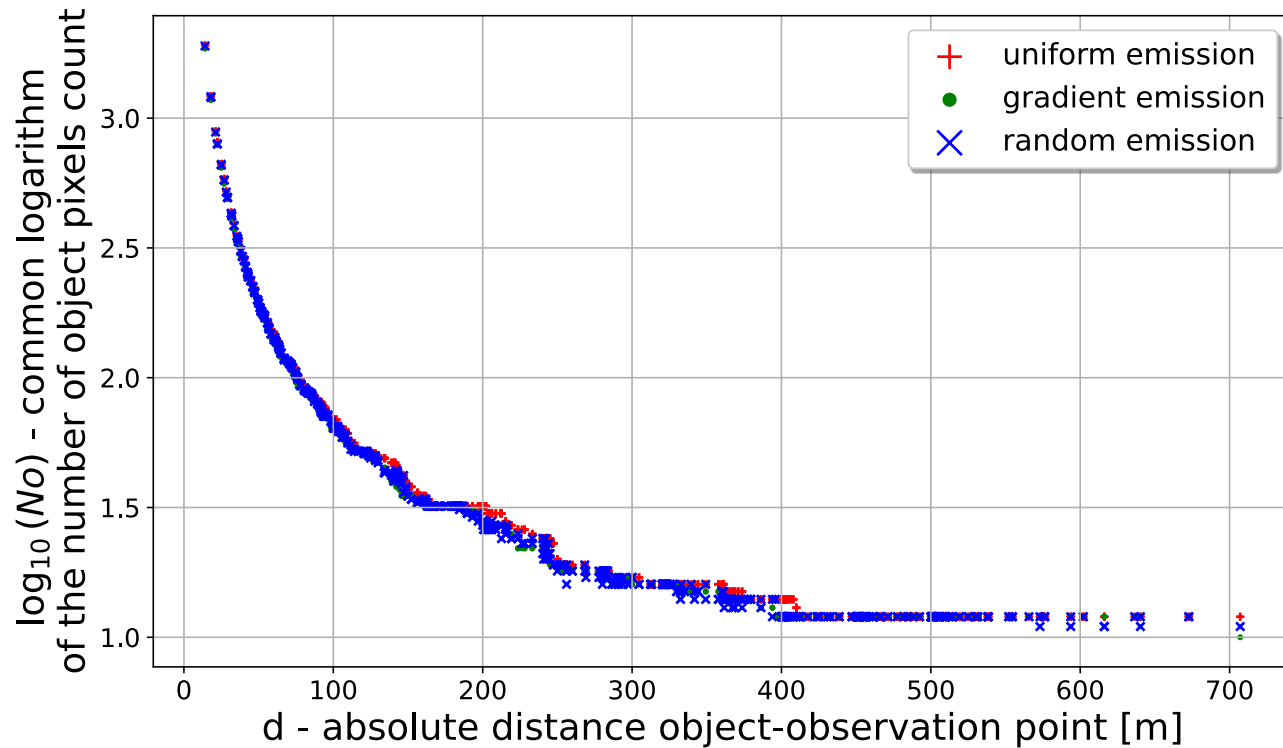
Theoretical model - objects



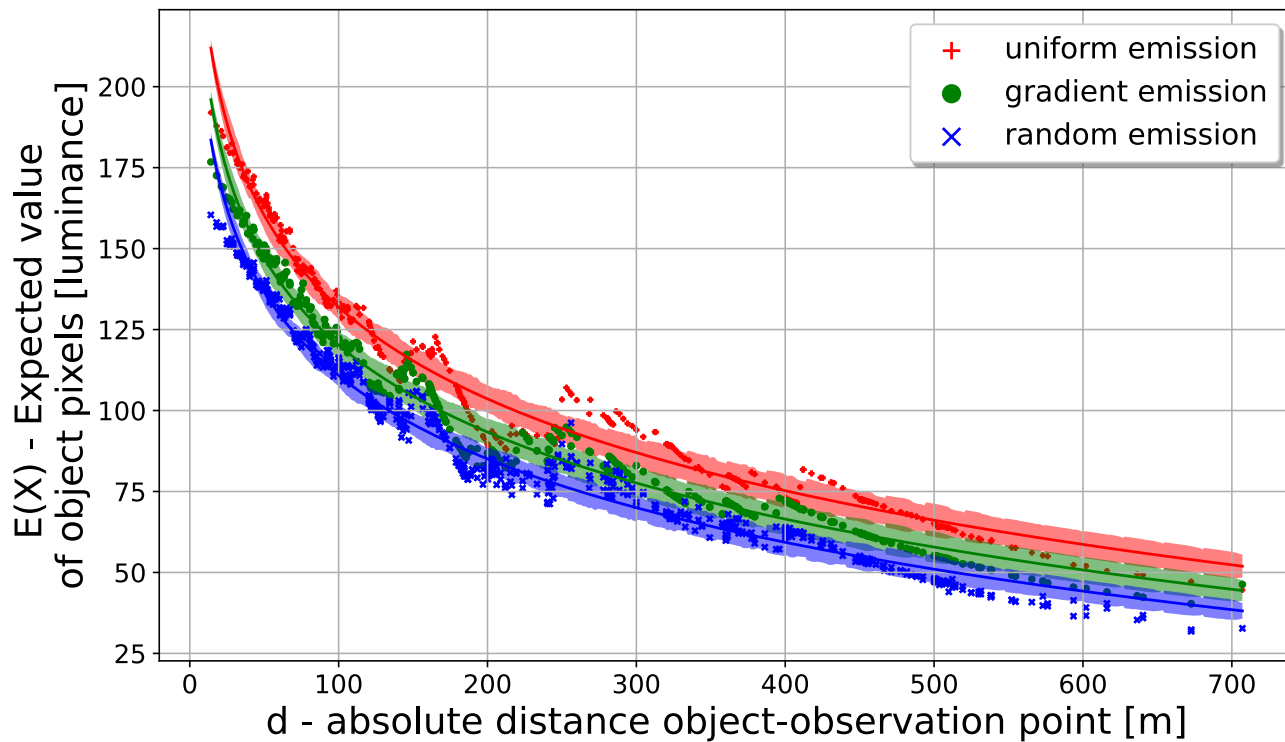
Theoretical model - setup



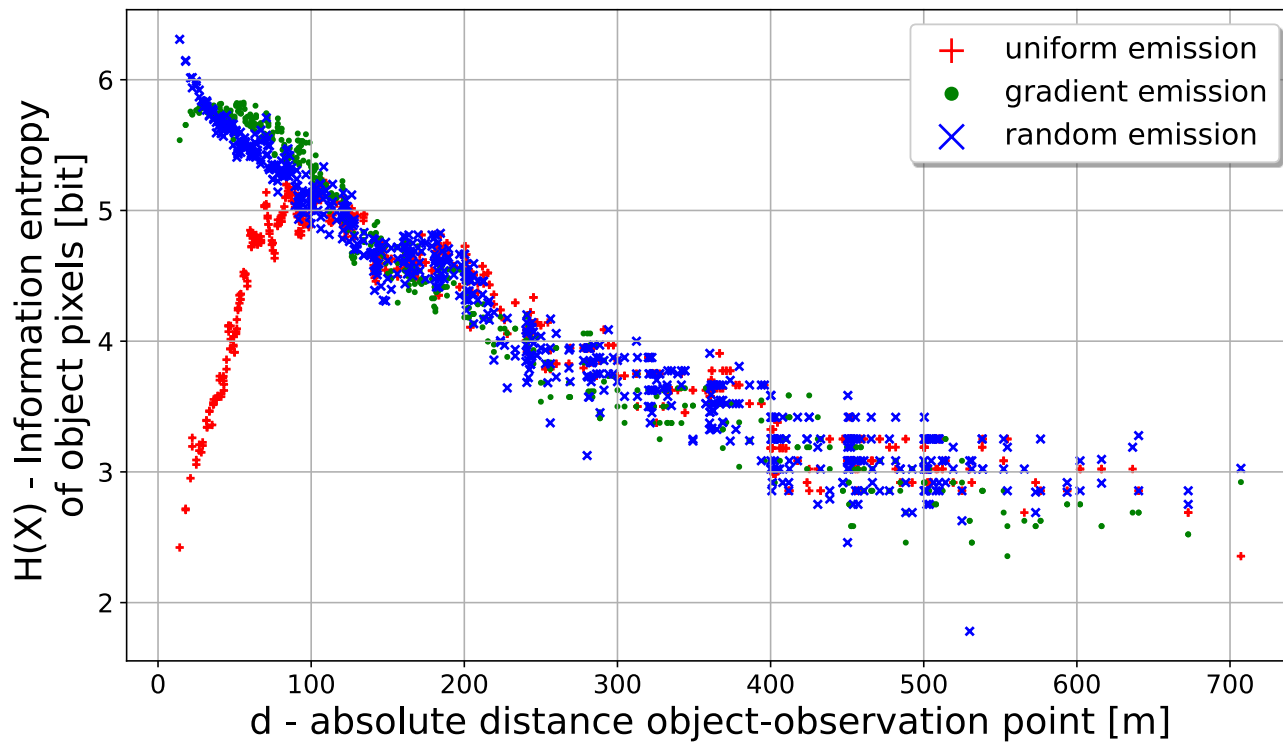
Theoretical model – outcomes 1/3



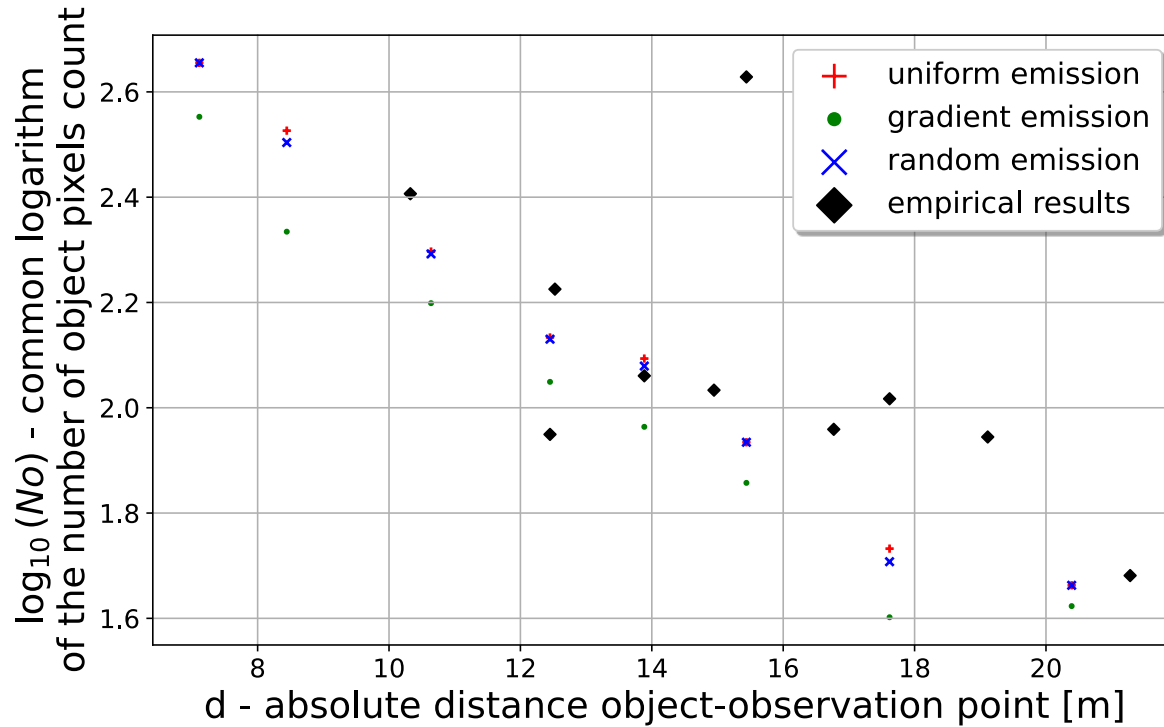
Theoretical model – outcomes 2/3



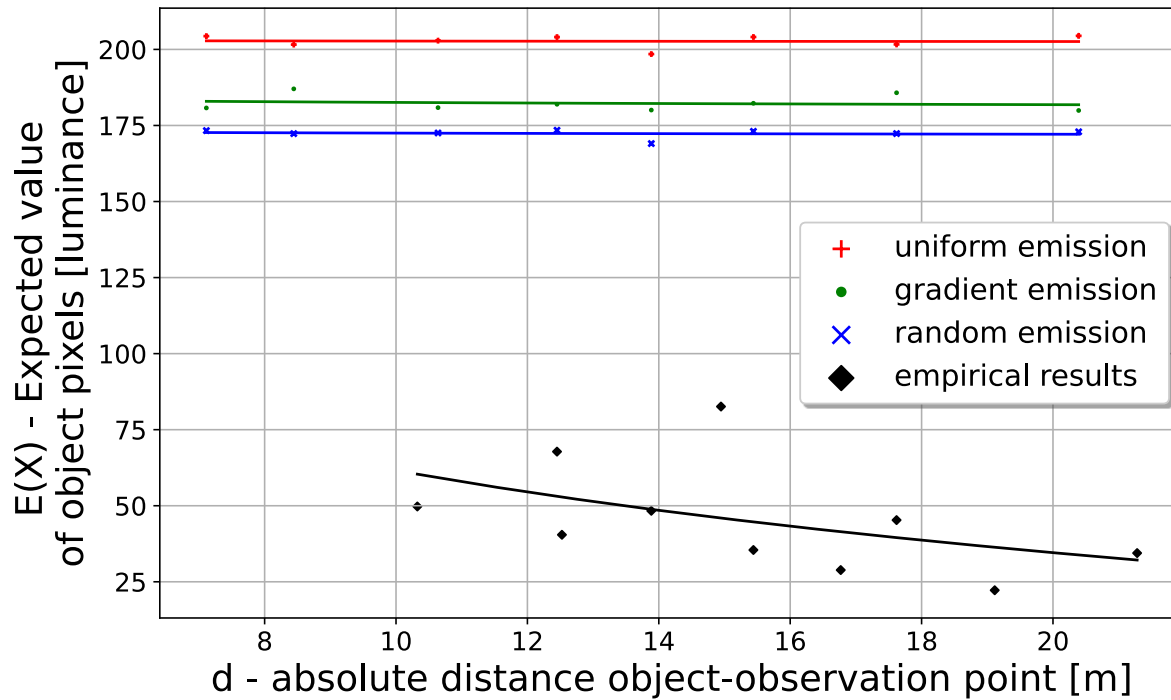
Theoretical model – outcomes 3/3



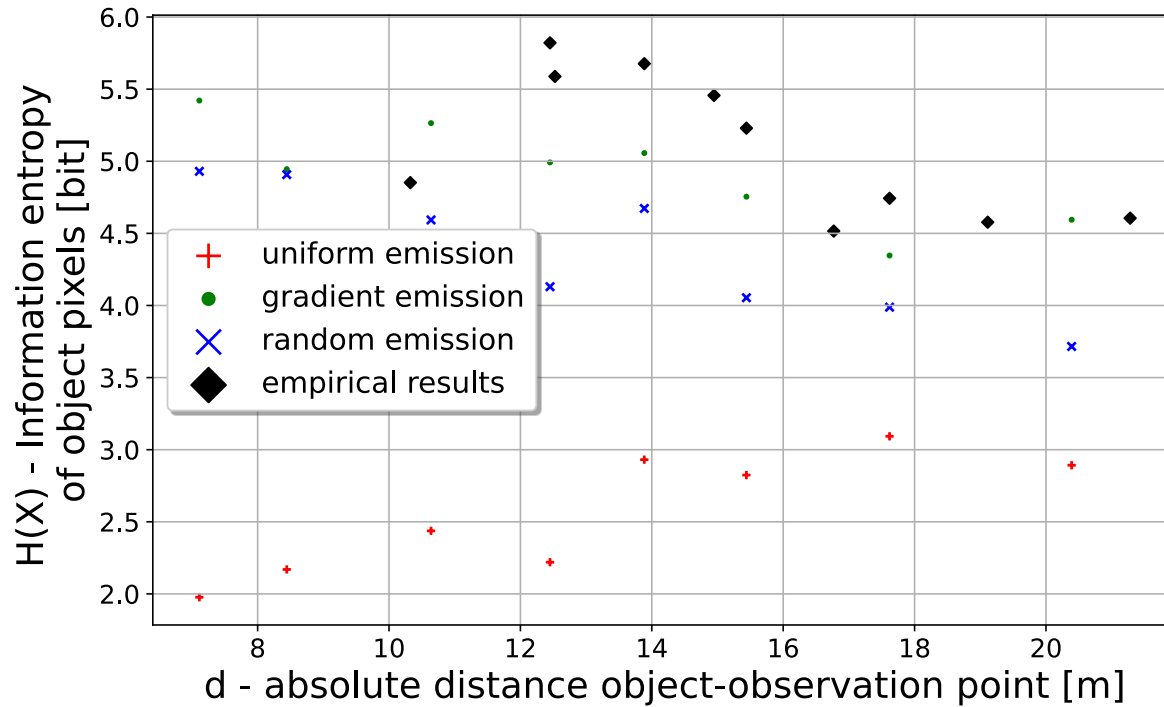
Empirical evaluation 1/3



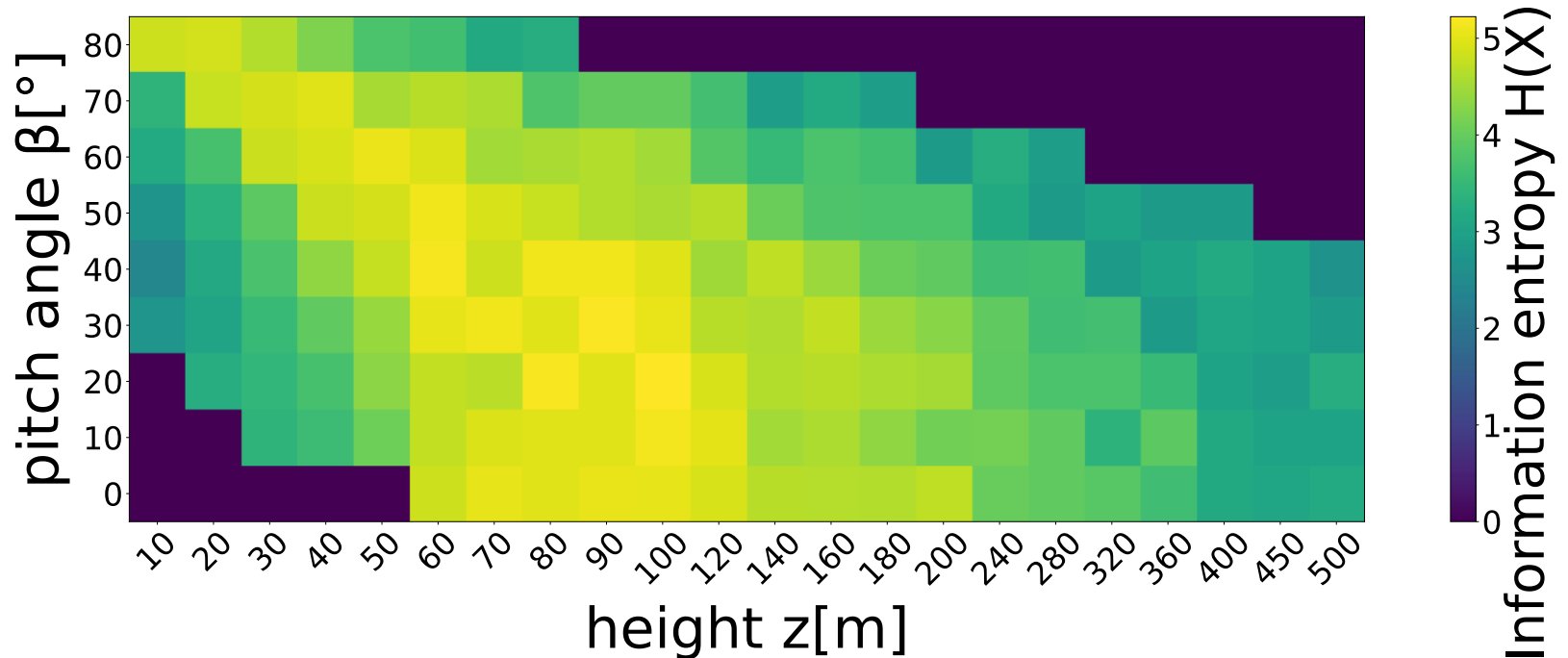
Empirical evaluation 2/3



Empirical evaluation 3/3



Theoretical model synthesis



Mentioned sources

- Pušnik I, Geršak G. Evaluation of the Size-of-Source Effect in Thermal Imaging Cameras
- P. Povlsen, A. C. Linder, H. L. Larsen, P. Durdevic, D. O. Arroyo, D. Bruhn, C. Pertoldi, and S. Pagh, Using Drones with Thermal Imaging to Estimate Population Counts of European Hare (*Lepus europaeus*) in Denmark
- Z. Mayer, A. Epperlein, E. Vollmer, R. Volk, and F. Schultmann, “Investigating the Quality of UAV-Based Images for the Thermographic Analysis of Buildings”
- J. K. D. Lagman, A. B. Evangelista, and C. C. Paglinawan, “Unmanned Aerial Vehicle with Human Detection and People Counter Using YOLO v5 and Thermal Camera for Search Operations”

Thank You

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